

Learning Disorders as a School Health Problem

Neurological and Psychiatric Aspects

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■ *Broadened concepts of intellectual functions have shown that many varieties of mental subnormality may be preventable or subject to improvement with proper treatment. Many types of neurologic dysfunction are accompanied by learning disorders based on specific intellectual deficits.*

A more refined delineation of the higher cerebral functions of each child with a learning disorder provides the basis for improved specific remedial educational techniques. Such detailed assessment of higher functions of the nervous system can be greatly enhanced by the appropriate special evaluations carried out by well trained psychologists, speech pathologists and educational consultants, working in cooperation with physicians.

The varieties of adjustment problems of children and emotional impact of a learning disorder should be recognized as early as possible and treated appropriately. Motor and perceptual-motor therapies may have limited value in some cases but may be harmful if indiscriminately applied. Psychotropic drugs have a relatively limited place in the management of learning disorders but may be immensely valuable in some cases by helping to control specific behavior problems which interfere with learning processes.

Physicians have a major responsibility to provide help and leadership in dealing with learning disorders.

MOST ESTIMATES PLACE the incidence of mental retardation, as customarily defined on the basis of an intelligence quotient score below 70 on a standard test, at approximately 3 percent of the total population.^{88, 114} However, Zigler has pointed out that the actual incidence of mild grades of mental retardation appears to be much greater than would be predicted on the basis of a theoretical distribution pattern for "intelligence" in our society.¹⁴³ Many borderline forms of mental subnormality are often more obscure and undiagnosed. These milder learning difficulties afflict a much larger group of children, probably eight to ten times greater than the number with more obvious, more profound degrees of mental retardation.^{52, 77}

In a broad sense, the concept of mild mental retardation may be properly extended beyond the usual simple I.Q. classification (50 to 70) to include children with specific, often severely handicapping learning disabilities, such as "developmental dyslexia," despite an I.Q. score lying within the "normal" range or higher. This broader concept incorporates the definition of intelligence on a multilateral pattern of learning and memory and performance functions which may be pliable and subject to modification in various ways. It contradicts the older notion of intelligence as a more or less unitary level of capacities which remain static, rigidly fixed for each individual, from early infancy. It contradicts and condemns the traditional sterile doctrine of viewing mental retardation as "an unmodifiable cerebral condition which led to incurable behavioral inadequacy"—that is, a global intellectual subnormality.¹⁵

The importance of this subject lies not only in its present and apparently increasing prevalence, but also in the generally higher individual potential which may be realized through the earliest possible detection, adequate evaluation, and appropriate remediation. It has been amply demonstrated that mild mental subnormality, when neglected or mishandled, plays a heavy contributory role in psychiatric illness, addiction, delinquency, crime, and other economic waste.^{87, 103, 104}

Children with milder learning disorders often present difficult problems to physicians, both in

public health settings and in private practice. All physicians should work vigorously toward a more sophisticated understanding of these problems.^{52, 61, 108}

Etiology

That learning problems may result from many causes has been increasingly apparent. Traditional views of the classification of mental retardation as *either* exogenous *or* endogenous have been largely replaced by a broader understanding of the many factors which influence learning processes.^{61, 81}

These potential etiologic factors include ethnic and cultural influences, socio-economic status, educational facilities, family relationships, individual temperament and behavior patterns, and emotional and motivational factors, as well as a large variety of more subtle disorders of the central nervous system.⁵²

Cultural-Familial Retardation

By far the largest group, the "cultural-familial" form of mild mental subnormality is practically confined to socio-economically and educationally disadvantaged families. The long-standing question in these cases about the relative etiologic importance of hereditary and environmental factors remains largely unsettled, along with the question about whether these individuals really differ essentially from the normal population in the qualitative aspects of their cognitive functions.¹⁰³

Quite often, gross deficiencies in parental care and training of children are encountered in disadvantaged families.⁷⁹ As enumerated in a recent report by the Group for the Advancement of Psychiatry,⁶¹ specific sociocultural factors related to the family setting include the following:

- Insufficient or discontinuous mothering with physical neglect.
- Distorted patterns of child rearing with psychotic or retarded parents.
- Family disorganization: absent members; antisocial behavior in one or more family members.
- Social isolation of family and family members.
- Poverty, crowding, noise, lack of privacy, preventing personal ownership and control of physical *objects* (toys, games, books, clothes, beds), as well as control of *space* and *time*.

Many slum children come to school with dialectic differences and also with behavior patterns which have been essential to their growth and sur-

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vival within their home or neighborhood environment. Their heightened distractibility and limited techniques for impulse control may seriously interfere with ordinary classroom learning. Other subtle perceptual and conceptual deficits frequently complicate the learning problems of these children.²³

Brain Damage

Aside from possible hereditary neurological weaknesses, socioculturally disadvantaged children generally have a high risk of organic factors as a result of nutritional inadequacies, gestational insults, postnatal infection, cerebral trauma, and frequently substandard medical care. Similar subtle and generally unrecognized structural damage of the brain also occurs during the fetal and perinatal life of children in middle and upper economic class families.^{88,94}

In a retrospective study Kawi and Pasamanick showed that complications of pregnancy, premature birth, and abnormalities of the prenatal and paranatal periods were far more frequent among cases of reading disability than among controls. Particularly important factors were found to be the toxemias of pregnancy (pre-eclampsia, hypertensive disease), bleeding before the third trimester, placenta praevia, and premature separation of the placenta. Kawi and Pasamanick concluded that "there is a continuum of reproductive casualty with a lethal component consisting of abortions, stillbirths, and neonatal deaths, and a sublethal component consisting of cerebral palsy, epilepsy, mental deficiency, and behavior disorders in children."^{69,70}

Recently Towbin reported correlations of clinical case material with over 600 fetal (stillborn) and neonatal brain specimens studied, using a technique of whole-brain serial histologic section, which made possible the consistent identification and the geographical localizations of focal lesions, large and small.¹³² He showed that two types of damage commonly occur: (1) in the premature fetus and newborn (25 to 35 weeks gestation), the usual hemorrhagic infarction chiefly involves the periventricular white matter and basal ganglia, due to the vulnerability to hypoxia of the highly vascular deep, rapidly developing deposits of germinal matrix tissue; (2) in infants born at full term the cerebral cortex is relatively more vulnerable to hypoxic damage because of the shift of biologic activity and vascularity during this stage of maturation.

Towbin's study provides evidence that neonatal cerebral damage often has its origin prior to labor. These pathological findings indicate that the frequent and paradoxical occurrence of cerebral palsy and organic mental retardation in infants having a history of uncomplicated non-cyanotic delivery may be due to prenatal cerebral hypoxic damage.

Towbin pointed out that lesser degrees of hypoxic injury may escape detection even microscopically, that the depletion in the nerve cell population may be subtle and unrecognizable. An overall loss of neurons up to 10 percent cannot be easily adjudged, even though the loss may amount to millions of nerve cells. The most differentiated, most highly specialized neurons are the most vulnerable ones of the entire body to hypoxic injury.¹³²

While lethal prenatal cerebral lesions contribute heavily to the high incidence of neonatal mortality, lesser grades of hypoxic prenatal cerebral damage may be largely asymptomatic during infancy. Delays in language and motor development may be the first clear indications of subtle cerebral dysfunction and future learning problems based on prenatal cerebral damage.¹³⁹

Genetic Abnormalities

In recent years a number of chromosomal abnormalities have been identified in some relatively uncommon syndromes which are accompanied by mental subnormality,^{22,25} also several inborn errors of metabolism which critically affect cerebral function have been described and delineated.¹¹¹ These studies have shown clear indications that some varieties of severe mental retardation may be preventable with early diagnosis.^{52,111} Many issues have been raised by these studies, and many questions about the role of hereditary factors in learning disorders still remain unanswered.^{7,44}

Specific Learning Disorders

"Specific developmental dyslexia" probably has been the most intensely studied, as well as the most controversial specific learning disorder. This condition was first reported in 1896 by a British general practitioner, W. Pringle Morgan, ⁹⁹ as "A Case of Congenital Word Blindness." Morgan wrote:

Percy F.—a well-grown lad, aged 14 . . . is the eldest son of intelligent parents, the second child in a family of seven. He has al-

ways been a bright and intelligent boy, quick at games and in no way inferior to others of his age. His greatest difficulty . . . his inability to learn to read . . . is remarkable, and so pronounced, that I have no doubt it is due to some congenital defect. He has been at school or under tutors since he was seven years old, and the greatest efforts have been made to teach him to read, but in spite of this laborious and persistent training, he can only with difficulty spell words of one syllable . . . The schoolmaster who has taught him for some years says that he would be the smartest lad in the school if the instruction were entirely oral . . .

Many other case reports appeared during the next few decades, especially by ophthalmologists, who were often the first physicians consulted about failure to learn to read.³⁶ In the first monograph on this subject, published in 1917, James Hinshelwood, a Scottish eye surgeon, reviewed his personal series of 31 cases gathered over a period of nearly 20 years. Hinshelwood regarded this as a relatively uncommon hereditary defect "occurring in children with otherwise normal and undamaged brains."⁶⁷

The first comprehensive study of neurological and psychiatric aspects of specific reading disability was made by an American, Samuel T. Orton. In his classic monograph, published in 1937, Orton emphasized the relationship of reading disability to other developmental language disorders, congenital dyspraxia, and ambiguous or confused handedness.¹⁰¹

Following Orton's studies, Paul Schilder and Lauretta Bender developed the concept that developmental dyslexia is a manifestation of disturbed Gestalt function and an accompanying lag in cerebral maturation.^{10,12,115} More recently, Drew reported an intensive neurological evaluation of three dyslexic individuals in one family. His findings suggested that parietal lobe involvement was the anatomic substrate for a general disturbance in Gestalt function.³⁹

Several extensive medical studies by Scandinavian workers, particularly those by Skydsgaard,¹²⁶ Hallgren⁶³ and Hermann,⁶⁶ emphasized the essentially "pure" or specific nature of developmental dyslexia, which they regarded as an hereditary nosological entity. Hallgren concluded from a clinical study of 276 cases the specific dyslexia follows a monohybrid autosomal dominant mode of inheritance with almost complete manifestation.

Since the pioneer multidisciplinary research

report on reading disorders in 1954 by Ralph Rabinovitch and his colleagues at the University of Michigan,¹⁰⁹ there has been rapid growth of interest in medical research in this field. Within the present decade, President John F. Kennedy's vigorous leadership and concern over mental retardation marked the start of a new era of public involvement.¹⁰³

An enormous amount of evidence has accumulated, relating learning disorders to linguistic, perceptual and other developmental neurological functions.^{37,54,90,97} However, despite this growth of knowledge, there has been considerable resistance to the acceptance of neurological factors as etiologically significant.¹⁰⁶ Conversely, other investigators have extended neurological theory beyond established boundaries to provide rationalizations for faddist remedial techniques.^{90,97}

Additional diagnostic perplexity has arisen from the multitude of terms used in various national, state, and local school programs to designate special classes for children who are classified as "educationally handicapped" (EH), "neurologically handicapped," (NH) "perceptually handicapped," or "mentally exceptional."

Many educators and psychologists have opposed all medical concepts of learning disorders, and have resisted the use of terms with medical implications, such as congenital word-blindness, specific language disability, strephosymbolia, developmental dyslexia, and minimal brain dysfunction. Their objections include (1) an unwillingness to consider any hypothesis which relates "milder" learning disorders to cerebral dysfunction; (2) failure to find proof that developmental dyslexia exists as a pure nosological entity affecting any substantial number of children; (3) failure to find any differences between dyslexic children and normal readers in the types of errors made in reading; (4) the great variation in frequency of reading disability in different classes; (5) the usual concurrence of reading disabilities with other defects, and (6) the belief that reading and other language disabilities "should be regarded as phenomena which fall within the framework of normal variation."⁸⁶

Recognizing this controversy, Shankweiler¹¹⁸ recently wrote:

Developmental dyslexia clearly should not be regarded as a unitary condition. Just as there are a number of acquired cerebral syndromes in which dyslexia is a prominent symptom, developmental syndromes occur which include reading disabilities of varying

degrees of purity. Developmental dyslexia is necessarily a rather broad concept which refers to a number of types of reading disability which may or may not be related in etiology and in the underlying disturbance of function. The term "developmental dyslexia" is worth retaining, because it refers to a group of disorders which are profitably to be distinguished from the mass of cases of reading backwardness. Clearly, a careful delineation of the various dyslexia syndromes is of the greatest importance for treatment. At present there is little solid knowledge of any of these syndromes and only hints as to ways in which different types of reading disability are linked to salient features of development.

At its meeting in Dallas in April 1968, the World Federation of Neurology's Research Group on Developmental Dyslexia and World Illiteracy, under the leadership of Dr. Macdonald Critchley, formulated and unanimously approved the following definitions:

1. *Specific Developmental Dyslexia*: A disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence, and socio-cultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin.

2. *Dyslexia*: A disorder in children who, despite conventional classroom experience, fail to attain the language skills of reading, writing, and spelling commensurate with their intellectual abilities.¹³⁴

In addition to developmental dyslexia, other specific learning disorders are related to deficits in other symbolic functions and intellectual capacities, such as directionality, space-time perception, abstract conceptualization, attention span, and impulse control.³³ Specific writing disability (dysgraphia) may be a practically isolated type of motor deficit, although it often is part of a more diffuse "clumsy child syndrome," or a "congenital dyspraxia."⁶² Most cases of "specific" learning disabilities show mixtures of such deficits. Each child presents a unique pattern of symptoms and a complex mixture of relative weaknesses and strengths.³²

Neurological Studies

During recent years considerable effort has been devoted to the development of more refined techniques for the neurological examination of children with learning and language disorders.³⁶ Many reports have described the possible diagnostic value of various equivocal or "soft" signs, which are

often found in these cases in an expanded neurological examination.^{4,19,27,31,38,123,124,125} There is need for further standardization and evaluation of many of these equivocal but apparently useful techniques. Some of these "soft" signs include an isolated pathologic toe sign, reflex asymmetry, mild ataxias, tremors, clumsiness, mild hearing defect, and abnormality of extraocular movements. Several of the older neurological tests of higher cerebral function have also recently been studied more intensively in children with learning disorders. These include:

- Synkinesis, also known as abnormal associated movements, mirror movements, or adventitious overflow movements^{1,30,47}

- Arm extension test^{27,121,125}
- Head rotation test^{27,121}
- Dual simultaneous sensory testing^{13,78,144}
- Imitation of gestures¹⁷
- Right-left orientation^{9,14}
- Finger identification and localization^{14,75,76}
- Choreiform syndrome^{93,107,112}

A recent study in England on the visuo-motor abilities of 810 healthy school children brought to light 54 cases (6.7 percent) in which performance was so deficient as to suggest a specific developmental failure. The children with visuo-motor impairment were significantly inferior to controls in a series of tests of spatial judgment and manual skill; they showed a variety of educational problems, especially in spelling and arithmetic. This carefully conducted study supports the view that agnosic-apraxic disabilities in otherwise normal children are "by no means rare and warrant wider recognition."²⁰

One-half or more of children with learning disorders reported in various studies have shown significant electroencephalographic abnormalities.^{8,31,72} Focal dysrhythmia, especially parieto-occipital, is common. In other cases the dysrhythmia is more diffuse. Obviously, a diagnosis of a learning disorder cannot be made from the electroencephalogram, and a normal electroencephalogram does not rule out a learning disorder.^{2,6,58,71,140}

The value of the electroencephalogram in these conditions lies in (1) providing more complete evaluation of the nervous system, (2) confirmation of the "organic" nature of the learning disorder in some instances, (3) ruling out a hidden seizure disorder, (4) providing a baseline for future re-evaluation, and (5) better insuring the safety of a trial of activating medications which may at times

precipitate seizures (for example, deaner, phenothiazines).

Minimal Brain Dysfunction

Recently the term *minimal brain dysfunction* has been more or less officially adopted in this country for a large group of borderline problems of children, including specific learning disabilities, as recommended in a study sponsored by the National Institute of Neurological Diseases and Blindness.²⁶ Within this one general category there are included numerous patterns of intellectual, perceptual, conceptual, linguistic, sensory, motor, and behavioral difficulties. This diagnosis has its basis in the demonstration of one or several of these patterns.

There has been considerable opposition to this term, both from within and outside the medical profession, because of the very large variety of symptoms and signs which may lead to its use as a wastebasket sort of label.^{59,85} However, in its generality and stress on *dysfunction*, rather than on *disease*, this designation has the great advantage of indicating the need for special help, and still avoiding the branding of a child as "organically damaged."⁶ The term may be properly used for some children whose dysfunctions stem from largely social or psychogenic difficulties, as well as for those with borderline organic disorders of the brain.

When appropriately used, the term *minimal brain dysfunction* carries the implication of a relatively minor, hidden type of difficulty.²⁸ Unfortunately, it has been frequently confused with the older terms, *minimal brain injury* and *minimal brain damage*, which were formerly applied to the same types of problems. In contrast to the older terms, this newer designation implies flexibility, remediability, and a generally favorable prognosis.^{26,28}

Cruickshank noted a possible hazard of these labels: "... the use of the word 'minimal' frequently serves to minimize the problem in the minds of parents or to place it on a level of less seriousness than it deserves. In reality these children present the most complicated of all learning and adjustment problems ... There is nothing minimal about any brain dysfunction."³⁷ It is also important to realize that any misdiagnosis or misunderstanding of this type of problem can have potentially serious long-term implications for the child and his family.^{40,41,42}

Any form of deviant maturation in children has

a strong tendency to produce anxiety.²¹ Common defensive reactions against such anxiety include (1) attention-getting, hostile or aggressive behavior, (2) tics and other compulsive habits, (3) apathy, disinterest, daydreaming, withdrawal from social activities, bizarre attitudes, and autistic trends, (4) regressive phenomena such as recurrence of enuresis, (5) physical complaints, hypochondriasis, and somatization reactions.^{53,68,117,119,120} Any of these reactions may be the first indication for the parents to consult a physician about a learning problem.

However minimal, any grade of cerebral dysfunction is accompanied by some degree of ego weakness.¹¹ Many terms have been used to describe the deficiency in ego development or identity formation which generally occurs in children with learning problems: inferiority complex,¹⁰¹ pseudoneurosis,⁸⁰ impaired self-esteem, poor self-image, self-hatred,¹¹³ and others. An understanding of the nature of this ego weakness is essential for proper management of the entire learning disability.

Hyperkinetic Behavioral Syndromes

One of the most common difficulties in management is the hyperkinetic behavior syndrome, also called impulse control deficit, Strauss syndrome, and other terms. In this condition various degrees and combinations of motor restlessness, impulsivity, distractibility, short attention span, emotional lability, and outbursts of temper may occur.^{116,122}

This type of behavior is often erroneously regarded as entirely psychogenic—hence, the recent designation *pseudoneurosis*.⁸⁰ However, in most instances, hyperkinetic behavior probably reflects an imbalance in the functional relationships of the reticular formation of the brain stem with the limbic system and neocortex.^{105,127} Correction of this anatomical-functional imbalance probably is the basis for the frequently observed paradoxical quieting and stabilizing effects of stimulant drugs.

Psychiatric Studies

Most children with learning disorders show indications of emotional or behavioral reactions, both as a result and a complication of their failure to learn. In some instances these reactions are so severe that the entire complex problem may be wrongly considered to be primarily psychogenic. Conversely, in some children the emotional reac-

tions are kept well concealed. In general, the longer the delay in diagnosis and effective help for a milder learning disorder, the greater the effect on a child's personality.⁵⁷

Rabinovitch and coworkers¹⁰⁹ contrasted the differences in emotional reactions and therapeutic needs of children with different types of reading disability. Those cases classified as "primary reading retardation," based on a hidden neurologic deficit, show prominent anxiety and guilt about the reading incapacity itself. Children with "secondary reading retardation," based on exogenous factors, tend to show a wider range of emotional and behavioral problems, with their major anxieties centered on other problems and not mainly around school adjustment.

Failure to recognize the possible neurological background of a learning problem in a child with minimal brain dysfunction may lead to more serious psychic trauma, to which the child is already predisposed because of a coexistent lowered emotional threshold.¹¹ Another serious problem is the common inability of parents to recognize and secure early help for the secondary emotional symptoms which follow upon school failure and social rejection. Often, the child's most urgent need is to have a suitable opportunity to achieve some degree of real academic success as soon as possible.^{97,98,131}

In certain children, passive-aggressive behavior patterns present one of the most serious and treatment-resistant problems leading to underachievement, despite average or superior intellectual endowment. These patterns generally reflect difficulties arising from complexities of interaction between the child and his parent, often aggravated by pressures at school.^{85,110} In some cases other complex problems in family psychopathology operate as causative or complicating factors in learning disorders.^{45,87} Failure of a specific remedial educational program may result from a severe family problem, in which one parent, usually the father, is found to be a borderline psychotic whose social stability is preserved by the family's actions to maintain the status quo; the child's refractoriness to treatment is tied to his role in the family—a pseudostupid or infantile subidentity.⁹⁵

Early psychoanalytic writers stressed the importance of psychogenic factors in some cases of reading disability, implicating early traumatic incidents with later anxiety and guilt over unconscious scopophilic-coprophagic-phallophagic phantasies,

regressive gratification of genital impulses, and ambivalence about compulsive exhibitionistic-voyeuristic activity.^{3,18,128,130} Even as late as 1960 Anthony stated, "In general, most psychoanalytic authors agree that a regression to a sexualized and aggressivized mode of energy is characteristic of learning problems."⁵

While formulations in such terms may not be generally useful, there is no question that optimal levels of sensory and perceptual stimulation in very young children have great importance for the future development of language skills, problem solving, and other cognitive functions. Early distortions in the child's personality development related to maternal deprivation and other disturbed family relationships often lead to serious impairment in future learning abilities, as well as behavior disorders, psychopathic traits, and psychophysiologic derangements.²³

Such factors influence every therapeutic program for children who have had any appreciable degree of early personal deprivation, whether determined mainly by cultural and economic factors or by intrafamilial problems. Special difficulties presented by linguistic and motivational barriers to academic achievement in culturally deprived children, even in the earliest school years, also reflect attitudes which are likely to influence psychotherapy and other phases of medical treatment.¹⁰²

Diagnosis: the Interdisciplinary Team Approach

There is no single neurological pattern which is diagnostic of a learning disorder. Indeed, a learning disorder of any type, from a specific developmental dyslexia to a severe global mental retardation, may occur without any clear-cut abnormalities in the standard neurological examination.

An accurate diagnostic formulation of learning disorders requires consideration of multiple factors—social, educational, pediatric, psychiatric, neurologic, psychologic, and linguistic. It is essential that any physician consulted about a learning problem understand, first, the limitations of his own abilities and, second, the potential value of securing other help, both in diagnosis and therapy, from those in other medical specialties and in the cooperating professions.

An interdisciplinary group for comprehensive diagnostic study, and for the formulation and carrying out of a treatment program, may include various specialists in family practice, pediatrics,

psychiatry, neurology, ophthalmology, otolaryngology, psychology, education, speech pathology and linguistics, social service, occupational therapy, physical therapy, and nursing. A "minimal" interdisciplinary team for learning and language disorders would consist of a physician, a psychologist, a speech pathologist and a teacher.⁵¹

As a member of an interdisciplinary team, a physician must set aside, to some extent, his traditional role as an absolute authority on diagnosis and treatment. He must recognize and be able to make proper use of the unique training and frequently superior skills of the other members of the team.^{133,136}

Modern psychological testing, using a variety of standardized tests, provides the most refined diagnostic study of many of the highest cerebral functions, usually far beyond the range of the most extended study by a neurologist or psychiatrist. Similarly, the special evaluations carried out by a speech pathologist and an educational consultant provide detailed assessments of other complex functions of the nervous system. The examinations made by these specialists, who often overlap in their interests and skills, are essential to the diagnostic study and remedial planning for a child with a learning disorder.²⁶

Treatment: Psychotherapy

All non-educational types of treatment for learning disabilities are merely adjunctive or auxiliary to a remedial educational program, which is designed to help the specific cognitive deficits of an individual child. Psychotherapy is not a specific form of treatment for learning problems, except for those relatively uncommon cases in which the learning difficulties appear to be largely psychogenic.⁸²

A careful explanation about the nature of a child's learning problem usually has great value to the child and to his parents and often to his teacher, as well.⁶⁰ Any indications of limited grasp due to severe anxiety, denial mechanisms, and other problem attitudes should suggest the need to provide further guidance or other psychotherapy for the child and his family. More extensive psychiatric evaluation is also indicated whenever a child's behavioral difficulties and symptoms continue despite educational and other environmental help.^{56,102}

Psychotherapeutic help in many cases may be appropriately limited to practical counseling or

guidance for the parents. In most instances parents should be advised to provide an orderly, carefully planned, predictable schedule of home activities in a setting of consistently firm and fair discipline with definite limits of permissiveness, accompanied by kindness, understanding, helpfulness, and encouragement.

Whenever necessary, parents should have help in developing general guidelines and in planning the details of physical activities, recreation, and periods of rest. Usually, the physician should confer with the child's remedial teacher, school psychologist and other consultants before making specific recommendations to the parents about educational matters, such as advice about securing home tutoring or referral to a special school or clinic.

The preliminary planning should consider every available type of standard therapy which might improve the child's total functioning. In most cases, any indicated psychotherapy, drugs, and physical exercise programs can be advantageously used in combination during any phase of remedial education. More rarely, some preliminary period of psychiatric intervention (psychotherapy or drug therapy or both) may be necessary before a child can participate adequately in a remedial educational program.⁵²

Ideally, each portion of a "total push" program enhances the efficacy of all of the other means which are being used simultaneously. However, in some cases, too full a schedule may exhaust the energies of children and their parents. No form of treatment, however valuable, should be allowed to take away energy which is more urgently needed for other activities.⁷⁴ A hierarchy of treatment needs and values must be established and periodically reviewed in every case.

In some older children and adolescents more time and attention may appropriately be devoted to some form of direct psychotherapy with the child himself. But in every case the parents should also be involved in varying degrees. Other briefer supportive and interpretive forms of therapy may be considered in many instances. For some families a conjoint approach may be useful.^{48,102}

Most children with learning problems and their families derive considerable emotional support from the continuing interest and availability of their family physician. This continuing relationship provides for prompt help, whenever needed, over an extended period.⁵²

Motor and Perceptual-Motor Therapies

Several programs which emphasize training in body control and visual perception are currently in wide use for children with learning disorders. The methods advocated by Kephart, Getman, and Delacato use a number of similar techniques but with wide differences in theoretical bases.

Kephart's method for developing basic "motor generalization" is supposed to promote perceptual accuracy.^{72,73} Getman believes that deficiencies in various visual functions are the basis of learning difficulties; he combines visual training and general motor training.⁵⁵

The Doman-Delacato group believe that children with learning disorders lack "neurological organization." Their training methods aim at a patterned recapitulation of the phylogenetic-ontogenetic stages of locomotor development. They emphasize the use of measures to establish complete unilaterality of motor dominance for eye, hand, and foot, in the belief that these will accelerate and stabilize the localization of language functions in the dominant cerebral hemisphere.⁵⁰

All of these methods may have some value to some children with impaired motor and visual motor skills. The possibility that certain features of these methods may have particular value in some cases requires careful study. However, there is no clear evidence that any of these techniques has any specific educational value for the cognitive functions of children with learning disorders.

There has been considerable concern over the claims of the Doman-Delacato supporters for their theories and techniques which are not consistent with accepted neurological principles.^{50,138} Such a complex regimen may be potentially harmful to an individual child and his family when indiscriminately applied, especially in the place of more specific remedial educational techniques.¹³⁸ In 1968 twelve major health organizations in the United States of America and Canada concurred in a statement opposing the Doman-Delacato method.⁹²

In addition to the Getman program, many other orthoptic and optometric treatments are being used for children with learning disorders.⁶⁴ While eye muscle imbalance, convergence difficulties and refractive errors may contribute to learning problems, eye conditions are not generally regarded as the major etiologic factors.

That various unorthodox and faddist programs for children with learning disorders have had such rapid growth and wide use reflects a possible seri-

ous deficiency within the medical profession. Parents and educators have felt a critical need for more specific techniques and active help for children with learning and language disabilities. The long-standing tendency to isolationism of the medical profession and consequent barriers to freer communication with other concerned professions must be quickly broken down.^{24,138}

Physicians have a serious responsibility to inform and advise parents and educators about the rationale—the possible value and also the potential harmfulness—of any medically based program proposed for treatment of children with learning disorders, either within or outside the classroom. The relevance of any treatment to each child's specific problems should always be the primary consideration.⁹⁰

Early motor disabilities, even when mild and borderline, often lead to exclusion from play activities of peer groups, giving the child insufficient opportunities and motivation to practice motor skills, and a progressive aggravation of the child's basic deviations from the average motor development for his age.⁷⁴

Children with such borderline motor and visuo-motor handicaps may derive considerable help from a carefully planned remedial program designed to improve motor skills, body image awareness, right-left discrimination, and hand-eye interactions.^{34,35,37}

Many school systems still do not provide formal physical education programs until the level of junior high school or beyond. And most physical education programs chiefly provide an opportunity for the practice and improvement of motor skills already developed outside of school. Fortunately, some school systems are providing more ideal individualized remedial physical educational programs for children with borderline motor handicaps which complicate other learning problems. Physical therapists, occupational therapists, and physical educators with special interest and training can give considerable individual help to children with such difficulties. Physicians should have greater awareness of the general need for improved programs in physical education.³⁵

Cerebral Dominance

Treatments such as the Doman-Delacato method and some optometric programs which emphasize motor activities and other measures, such as eye occlusion, designed to influence cerebral domi-

nance, have no sound theoretical basis for the general treatment of learning disorders.^{97,138}

The entire problem of cerebral dominance is far more complex than previously believed. It is now recognized that the left cerebral hemisphere is dominant for language functions in many, probably a majority, of left-handed persons as well as in right-handers.^{91,100,129,141,142}

While anomalous handedness and mixed or confused eye-hand preference frequently occur in children with learning disorders, these do not have any cause-effect relationship.^{9,141} It is well known that similar patterns of confused or mixed motor laterality occur in the general populations with great frequency.¹³⁸

Handedness exists in many gradations; estimates of the incidence of left handedness vary from 1 percent to 30 percent in different studies, using different criteria and examination techniques.⁶⁵

Cerebral laterality for handedness and language are not directly linked, and one does not determine the other.⁹¹ Exercises and eye treatments which are designed to change laterality of motor skills cannot be expected to provide an effective basis for the specific treatment of a child with a complicated deficit in perceptual and other cognitive abilities.

Drug Therapy

Drugs have only relatively limited usefulness in the broad field of learning disorders.⁴⁹ However, in certain cases the proper use of a specific medication can be of great value in controlling behavioral symptoms which interfere with learning.^{43,46}

The cerebral stimulant drugs have been shown to have a paradoxical calming effect on hyperkinetic behavior. Either dextro-amphetamine (Dexedrine®) or methylphenidate (Ritalin®) may be effective when used in proper doses. These drugs may also be helpful for some children who have a short attention span or difficulty in concentration but are not otherwise hyperkinetic. Deanol (Deaner®) is a more controversial stimulant which may be of value in some cases.^{96,137}

Barbiturates and mild tranquilizers of the propenidol series, such as meprobamate (Miltown®), have generally less value in these problems and may actually have an undesirable paradoxical stimulant effect.

In some more severe forms of hyperactivity, especially when accompanied by more bizarre, negativistic, aggressive, schizoid or autistic behavior,

one of the major tranquilizers of the phenothiazine series may be useful. Here the choice generally lies between a more sedative agent such as chlorpromazine (Thorazine®) and thioridazine (Mellaril®) and a more stimulant drug such as trifluoperazine (Stelazine®) or fluphenazine (Prolixin®, Permitil®).

Other drugs which have been advocated for hyperkinetic behavior disorders include diphenylhydantoin sodium (Dilantin®), diphenhydramine (Benadryl®), hydroxyzine (Atarax®, Vistaril®), chlorthalidone (Librium®), and diazepam (Valium®). Anticonvulsants, such as diphenylhydantoin (Dilantin Sodium®) and primidone (Mysoline®), may best be reserved for use when a subclinical convulsive disorder is suspected.

In younger children with enuresis the tricyclic (iminodibenzyl) antidepressants, such as imipramine (Tofranil®) and nortriptyline (Aventyl®) are frequently quite valuable, both in providing fairly prompt bladder control and in helping classroom behavior. Older children and adolescents who have depressive trends also may be helped by tricyclic agents.

The dosage of any of these drugs should be individually adjusted, usually starting with small doses and increasing as rapidly as possible to the optimal effective level. Adequate arrangements should be made in every case to assure appropriate observations and medical supervision. Physicians may advantageously use the help of teachers and school nurses, both in administering a midday dose of medication and in observing the effects of a drug on the child's behavior in a variety of situations at school.^{83,135}

Many physicians disapprove the use of psychotropic medications for behavior disorders, on the ground that the prescription of drugs might be misinterpreted by parents or teachers and brand the child as "organically damaged." Others, especially psychiatrists, have viewed drugs as potentially anti-psychotherapeutic.

Drugs obviously cannot take the place of necessary remedial education, psychotherapy or environmental changes. However, appropriate drug therapy may facilitate any needed psychotherapy or special educational program. Postponement or refusal of a trial of indicated medication in behavioral syndromes complicating learning disorders can be an unwarranted barrier to prompt relief of symptoms which block learning.

Conclusion

Through his broad knowledge of higher cerebral functions and their complex relationships with general physical and mental health, the physician is in the best position to help parents understand their child's learning problem and to secure their cooperation in arranging for any necessary remediation. The physician is also the appropriate person to provide the general public, including legislators and school administrators, with sound information on the medical aspects of learning problems.²⁹

The physician has a major responsibility to provide the leadership in the development of team programs, to help integrate diagnostic and therapeutic procedures, and to work vigorously toward providing earlier and more complete help for children with learning disorders.^{42,52} It is clear that if the physician cannot play a leading role, these problems will be dealt with by those less competent to do so.⁹⁰

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ALPHA-TOCOPHEROL TO FORFEND THROMBOSIS

"About 19 years ago, a young man at our institution did some work on blood coagulation. He showed that alpha-tocopherol in the presence of calcium exerts an antithrombic effect. In the last 18 years, I have been using this routinely in all patients in whom I've done major surgical procedures. And in the 18 years that I've been using this routinely and immediately after operation, I've had one case of pulmonary embolism. I thought this was the one failure. But autopsy showed that the man's embolus came from his atrium, and not from his peripheral arterial system. He had it at the time we operated on him. So I think that this is a real worthwhile drug. The advantage of it is that although it decreases the thrombic activity, it doesn't increase the bleeding tendency. We use 100 international units, three times a day, given parenterally first and then by mouth."

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